Determinants of public capital spending in less-developed countries

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Abstract

In a great majority of countries throughout the world productive government services have declined as percentage of GDP since the 1970s. In the macroeconomic literature this is often associated with the general productivity growth decline, suggesting an important role for infrastructure investment in economic growth. However, this also raises the question as of why public capital spending declined in so many countries. Surprisingly, hardly any research on this exists. This paper is one of the first attempts to fill this gap by testing various hypotheses that may explain the development of government capital spending using panel data for 123 non-OECD countries for the period 1970–1998.

Politico-institutional variables, like ideology, political cohesion, political stability and political business cycles do not seem to be important when explaining government capital formation in less-developed economies. On the other hand, variables like public deficits, private investment and foreign aid are significantly related to public capital spending.

1 Introduction

There is a large literature on the determinants of private investment in less-developed countries. Two explanations for this interest can be put forward. First, recent empirical studies for developing countries have found positive, significant and robust effects of increases in investment ratio on economic

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growth.[1] In fact, Levine and Renelt (1992), Sala-i-Martin (1997) and Sturm and De Haan (2000) found that the ratio to GDP of total investment is among a few variables that are robustly correlated with growth for a diverse group of countries. This raises the question as of why the investment ratios across countries differ so much. Secondly, the debt crisis in the early 1980s have triggered the interest in the 'debt overhang' hypothesis. In general those studies have found support for the adverse effects of the debts service and debt overhang on private investment.[2]

In principal similar arguments can be made for public investment. However, on the determinants of publicly funded investment in less-developed countries hardly any research has been conducted. This lack of analysis is especially surprising, as in a great majority of countries throughout the world productive government services have declined as percentage of GDP since the 1970s. At the same time productivity growth plummeted worldwide. In his seminal work, Aschauer (1989) has hypothesized that this decrease in productive government services is crucial in explaining the general productivity growth decline. This hypothesis has received great attention in the literature ever since.[3] Many economists nowadays believe that there is an important role for infrastructure investment in economic growth. The implications for policymakers seem to be clear: public investment should go up to give a boost to the economy. Indeed, in many countries politicians of various political origins and international institutes like the World Bank and IMF support such policies. This raises the question, however, as of why public capital spending has declined in so many countries.

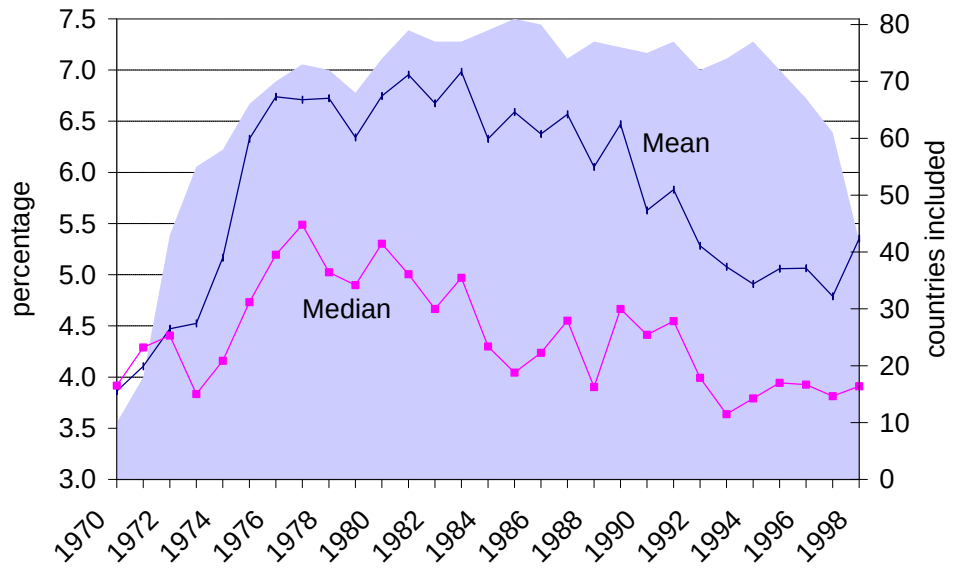
Using panel data for 123 non-OECD countries for the period 1970–1998 we test various hypotheses that may explain the development of government capital spending. We classify the hypotheses in three classes: structural, economic and politico-instititutional. The remainder of this paper is organized as follows. Section 2 describes the development of government capital spending in most developing countries over the period 1970–1998. The third section reviews previous studies on determinants of public capital investment, formulates the hypotheses and describes our variables. The fourth

[1] See, e.g. Ghura (1995), Ghura and Hadjimichael (1995), Savvides (1995), De Gregorio (1991), Barro (1991), Fischer (1991), Khan and Kumar (1993), and Khan and Reinhart (1990).

[2] See, e.g. Solimano (1989), Borensztein (1990a,b), Green and Villanueva (1991), Özler and Rodrik (1992), Cardoso (1993), Larrain and Vergara (1993), Servén and Solimano (1993), Sakr (1993) and Oshikoya (1994). 'Debt overhang' occurs when high external debt leads agents to anticipate future tax liabilities, thereby constraining current investment.

[3] For an extensive survey see Sturm (1998, Chapter 4).

Figure 1: Public capital spending as percentage of GDP: Unbalanced sample of 123 countries



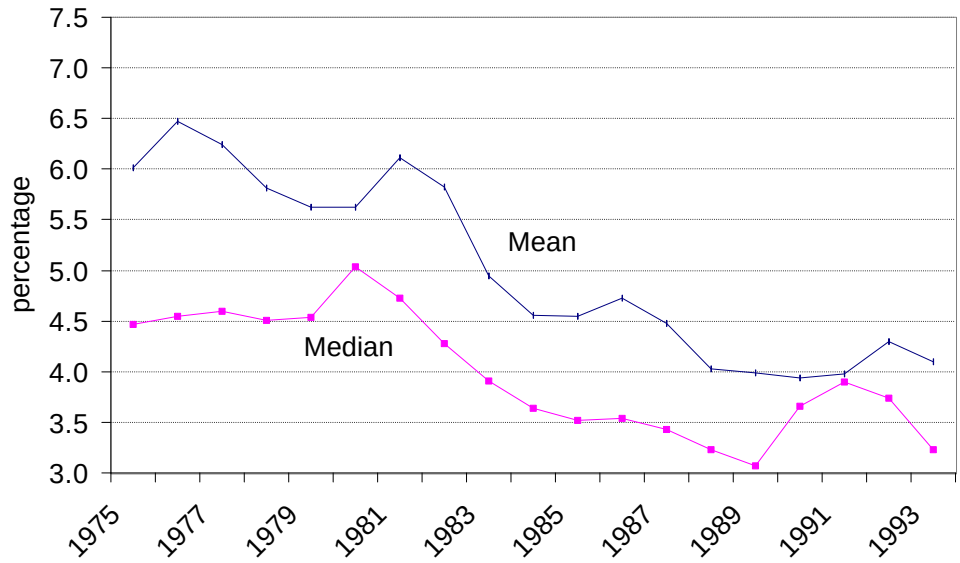
section presents our estimation results and the final section summarizes the paper.

2 Government capital spending

Figures 1 and 2 show central government capital expenditure as a share of GDP for respectively 123 and 37 countries over the period 1970–1998. Capital expenditure is spending of the central government only to acquire fixed capital assets, land, intangible assets, government stocks, and nonmilitary, nonfinancial assets. This also includes capital grants. The data have been taken from the 2000 World Bank Development Indicators CD-ROM published by the World Bank. They represent the most comprehensive expenditure series available on a comparable basis for a broad range of countries.

Figure 1 shows yearly averages and medians of the share of central government spending in GDP for a total of 123 countries. As we do not have data on all countries for all years the yearly samples differ substantially. The area on the background depicts the number of countries included in

Figure 2: Public capital spending as percentage of GDP: Balanced sample of 37 countries



each sample. For a maximum of 81 countries data is available in the year 1985. As part of the volatility in the graph might be due to these unbalanced samples, figure 2 shows a similar graph in case we restrict our attention to the largest balanced sample possible, i.e. for 37 less-developed countries covering the 1975–1993 period.

We would like to stress two observations from these two figures. First, since the mid 1970s there seems to be a clear decline in the share of central government capital expenditure. Of course there are exceptions, but for 70 percent of the countries for which data is available, we find lower numbers in the 1990–1995 period than in the 1975–1980 period.

Second, the average and median get closer over time, implying convergence of public capital spending shares across these countries. Or, countries which had large shares of central government expenditures in the 1970s have decreased spending at faster rates than countries with already relatively low shares.

However, what these figures cannot reveal is that central government capital spending varies considerably across countries. As this might partly be due to institutional differences, e.g. countries might differ quit a bit in

their shares of public investment by local vs. central governments, we will cope with this by including country fixed effects in the regressions.

3 Hypotheses

Except for the work of De Haan et al. (1996), who concentrate on OECD countries, there are, to the best of our knowledge, no panel studies explaining government capital spending. However, some authors have estimated time-series models for government investment spending for European countries. These studies have been summarized by De Haan et al. (1996) and Lybeck (1988). All studies are based upon various hypotheses put forward in the literature to explain government growth. Unfortunately, the various studies are fragmented and cannot be combined into a coherent theory. At best, they allow us to derive a number of more or less conflicting hypotheses. Following Kirchgässner and Pommerehne (1988) we distinguish three sets of explanatory variables:

Structural variables: degree of urbanization (URBPOP), population growth (GRPOP).

Economic variables: real economic growth (GRGDP), government budget deficits (DEFGDP), government debt (CGDBTGDP), interest payment of government (INTPAYGDP), private investment (GDFICAPGDP), foreign aid (AIDGNP), openness (TRADEGDP), foreign direct investment (FDIGDP).

Politico-institutional variables: ideology (EXECNAT, EXECREG, EXECL, EXECR), electoral cycles (EXELEC), coalition variables (IPCOH), Economic and political freedom (CIVLIB, POLRGHT), political instability (STABNS2).

The remainder of this section will review the reasons given by various authors to include these explanatory variables into a model explaining government capital spending.

Most studies explaining government size include the so-called structural variables to test for Wagner's law, especially in the version that stresses the transformation of the traditional society into the industrialized society with its shift from the family to the public sector of services like education and health care (Lybeck, 1988). The inclusion of the urbanization level can be interpreted in such a way, leading us to expect a positive sign. However,

in case of government capital spending there is also another demand-side reason for including the degree of urbanization. Most public capital spending concern infrastructure, and rural areas are in relatively more need of those. Hence, we hypothesize that a larger degree of urbanization will lead to less demand for infrastructure.[4] In a similar way, a growing population might increase demand.

Inflation and unemployment are generally included to take cyclical factors into account. In case of counter-cyclical policy one may expect public spending to be restrained when inflation accelerates and to be increased with rising unemployment levels (Aubin et al., 1988). Alternatively, the growth rate of real GDP can be used. Note that this reason for including GDP in the model differs from the conventional motivation, which is to test for Wagner's law (see, e.g. Henrekson, 1988), especially in the version that stresses the fact that many goods and services provided by government have a high income elasticity of demand.

The government budget deficit is often included to test for fiscal illusion. Again, interpretation problems may arise in case of government capital spending. It is often stated that governments should be allowed to borrow for public capital spending because of the redistributive effect over generations.[5]

High levels of budget deficits and/or government debt may lead to restrictive fiscal policy measures. Large debt interest payments crowd out other government spending categories. Countries might have offset increases in debt interest payments by winding back public capital spending. According to Oxley and Martin (1991) this pattern reflects "the political reality that it is easier to cut back or postpone investment spending than it is to cut current expenditures". Very often it is maintained that in periods of fiscal consolidation government investment is an easy target. Roubini and Sachs (1989b, pp. 108–109) argue that "in periods of restrictive fiscal policies and fiscal consolidation capital expenditures are the first to be reduced (often drastically) given that they are the least rigid component of expenditures". De Haan et al. (1996) report evidence in favor of this hypothesis for a large group of OECD countries in the 1980s.

Another hypothesis we will examine is whether private investment influences government capital spending, either because both types of investment

[4]Another similar variable is the initial per capita income in the previous period. The correlation between the degree of urbanization and per capita income—after correcting for country-specific effects—is quite high and equals 0.73.

[5]However, it is not clear how often this policy is officially pursued in our large group of less-developed countries.

are substitutes or move in tandem.

Besides alleviating immediate catastrophes, foreign aid is mostly intended to help create a better environment for sustainable economic growth. Donations are often restricted in their use to for instance improving infrastructure.

More open economies often are more vulnerable to foreign competition and compete for business by offering, among other things, adequate infrastructure. In a similar vein, to attract foreign direct investment a government could increase public capital spending.

A factor that has been treated extensively in the literature on public sector growth is the possibility that governments of a socialist (or social-democratic) persuasion tend to increase public expenditures at a faster rate than right-wing governments. Indeed, there are various studies (including Cameron, 1978, Roubini and Sachs, 1989b and De Haan and Sturm, 1994) that report evidence supporting these so-called Partisan cycles. However, Henrekson (1988) has pointed out that there is a problem with linking public sector size and the 'colour' of the party in power. The attitudes towards public expenditures of different parties may depend on what kind of expenditure is at issue. Parties of the right may, for instance, be in favour of higher spending on defence and police, whereas parties of the left may favour spending of a social welfare character. Van Dalen and Swank (1995) report evidence that spending on infrastructure in the Netherlands was higher under right-wing governments than under left-wing governments.[6] In line with the approach of these authors we test whether governments which are dominated by left-wing parties are more willing to cut investment spending than are right-wing governments. Another ideological issue might be the background of the political party in power. Rural or regional parties might be more inclined to provide infrastructure than other parties.

It has also been argued by various authors that the kind of government (coalition, majority government or minority government) may influence both government debt accumulation (Grilli et al., 1991) and the level of government spending (Roubini and Sachs, 1989b). The reasoning is that large coalition and minority governments may have more difficulties in reaching agreement to balance the budget (De Haan and Sturm, 1997). In that case, government investment spending will again be a more easy spending category to cut. However, Henrekson (1988) argues that a larger number of parties may increase the likelihood that an agreement between a party and an

[6] However, Sturm and De Haan (1998) do not find any evidence for this for the Netherlands.

interest group is reached. In his model for Swedish government investment he therefore included a coalition dummy which turned out to be significantly negative, which is in line with the hypothesis of Roubini and Sachs. Hence, we hypothesize that politically weak governments are more inclined to cut capital formation spending than are politically strong governments.

To test for political business cycle considerations electoral cycles are taken into account in some studies (Nordhaus, 1975). Van Dalen and Swank (1995) found, for instance, that elections are important in explaining infrastructure spending in the Netherlands. Schuknecht (2000) concludes that in particular public investment is used as an instrument to influence election outcomes in a group of 24 developing countries. Furthermore, Bates (1988) and Krueger and Turan (1993) show that public investment cycles have indeed been popular in respectively Zambia and Turkey. We will therefore also included an election variable in our model.

Economic and political liberalizations might give the private sector more room for own initiatives and lead the government to retract. Hence, we hypothesize that governments of more democratic countries will spend less on infrastructure.

Another hypothesis that we will test is that myopic governments will cut capital spending more than governments which have a longer policy horizon. As the benefits of investment spending generally do not show up in the short-run, myopic policymakers will be inclined to cut capital spending. It is our contention that the percent of veto players who drop from the government may be a good proxy for the time-horizon of policymakers (see also De Haan and Sturm, 1994).

Note that some issues which mainly explain the cross-sectional differences are not taken up in the analysis. For instance, electoral rules and federalism are not listed above. These and other institutional variables will be captured by the country-specific fixed effects allowed for in the econometric specifications.

4 Estimation results

Table 1 summarizes the data used. All structural and economic variables stem from the 2000 World Bank Development Indicators CD-ROM. Unless mentioned otherwise, the political indicators are extracted from the Database of Political Institutions, Version 2 as collected and described by Beck et al. (1999).

Our testing approach goes as follows. We start with a basic model to

Table 1: Summary statistics

Series	Obs	Mean	Std Error	Minimum	Maximum
CAPGDP	1725	5.93	4.97	0.10	40.85
URBPOP	1725	45.99	23.66	3.84	100.00
GRPOP	1725	2.26	1.51	-4.54	18.02
GRGDP	1725	3.73	5.76	-30.76	29.44
DEFGDP	1700	3.46	5.94	-58.71	31.63
CGDBTGDP	1022	50.29	47.01	0.44	447.34
INTPAYGDP	1542	2.60	2.84	0.00	27.03
GDFICAPGDP	1566	16.92	7.96	0.05	66.84
AIDGNP	1655	5.66	8.02	-0.57	69.71
TRADEGDP	1680	76.92	53.65	2.15	439.03
FDIGDP	1581	1.74	3.47	-24.03	33.44
EXECNAT	1497	0.15	0.36	0.00	1.00
EXECREG	1497	0.01	0.11	0.00	1.00
EXECL	1385	0.28	0.45	0.00	1.00
EXECR	1385	0.25	0.43	0.00	1.00
EXELEC	1497	0.08	0.27	0.00	1.00
PRESIPCOH0	1496	0.46	0.50	0.00	1.00
PRESIPCOH1	1496	0.27	0.44	0.00	1.00
PARLIPCOH0	1496	0.18	0.38	0.00	1.00
PARLIPCOH1	1496	0.02	0.13	0.00	1.00
PARLIPCOH2	1496	0.05	0.21	0.00	1.00
PARLIPCOH3	1496	0.03	0.18	0.00	1.00
CIVLIB	1700	4.13	1.62	1.00	7.00
POLRGHT	1700	4.06	1.98	1.00	7.00
STABNS2	1509	0.11	0.28	0.00	1.00

Table 2: Structural variables

Exp.var.	(1)	(2)	(3)	(4)
CAPGDP1	0.67	0.66	0.67	0.66
	(37.19)	(35.94)	(37.14)	(35.93)
GRGDP	0.04	0.04	0.04	0.04
	(4.46)	(3.99)	(4.41)	(4.03)
URBPOP		-0.04		-0.04
		(-3.92)		(-3.97)
GRPOP			0.02	-0.04
			(0.26)	(-0.66)
Adj.R2	0.83	0.83	0.83	0.83
No.obs.	1725	1725	1725	1725
No.Cntrs	118	118	118	118
No.Yrs	28	28	28	28

which various variables are added to test the hypotheses outlined in the previous section. The explanatory variables in the basic model are the lagged dependent variable—to capture the persistence in public capital spending over time— and the growth rate of real GDP—to correct for cyclical effects. These variables have been selected on the basis of the time-series models and on their robustness in the regressions. To capture institutional differences, the model is estimated with fixed country effects. Column (1) of Table 2 shows the basic model. All explanatory variables have the theoretically expected sign and are highly significant. Next we add potential structural, economic and politico-institutional variables. In case we find some of these variables robustly related to central government capital spending, the base model will be expanded.

4.1 Structural variables

Column (2) of Table 2 adds the degree of urbanization to the model. The negative sign of the degree of urbanization suggests that rural economies require higher levels of public capital spending.

Population growth does not seem to effect public capital spending (Columns (3) and (4) of Table 2). This variable is never significant whatever model we specify. For instance, lagging the variables or restricting the sample to the largest balanced group possible still renders an insignificant coefficient of population growth, whereas the degree of urbanization remains significant (not shown).

Given the significance and robustness of the urbanization level, we opt to include it into our base model.[7]

4.2 Economic variables

Next we explore the economic hypotheses put forward in the previous section. Table 3 starts by including the government budget deficit. This variable is highly significant and has a positive sign indicating that increased capital spending is at least partly deficit financed. To further explore this issue the next column shows the results in case budget deficits of the previous period is also taken into account. The lagged deficits are highly significant but of the opposite sign. Large deficits in the past lowers capital spending in the future.[8]

Central government debt is significantly negative in Column (3) of Table 3, despite the inclusion of the lagged deficit variable.[9] Hence, high debt makes freeing up funds for capital spending more difficult. Interest payments of the government do not significantly explain public capital spending (Column (4) of Table 3).[10] The conclusion does not change if central government debt is also included (Column (5) of Table 3).

Note that the degrees of freedom drop by nearly a third in the models in which central government debt is included (Columns (3) and (5) of Table 3). Nevertheless the coefficients of the other variables and their significance levels stay roughly the same.[11]

[7] Replacing the degree of urbanization by lagged GDP per capita does not qualitatively change any of these and following conclusions. Due to collinearity (see footnote 4), including both at the same time leads to both being insignificant at conventional levels.

[8] In case only the lagged deficit variable is included the same result applies.

[9] Without the lagged deficit variable its significance rises further.

[10] Removing the lagged deficit variable makes interest payment significant at the 10 per cent level with the expected negative sign.

[11] In less-developed economies most central government debt is part of external debt. In practice the correlation between both variables is 81.5 per cent for our sample of countries, and 0.76 if corrected for country-specific effects. Hence, besides problem in the interpretation, including both in one model would lead to multicollinearity problems. We therefore restrict our attention to central government debt.

Table 3: Economic variables

Exp.var.	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
CAPGDP1	0.62	0.68	0.62	0.65	0.63	0.70	0.64	0.67	0.66	0.61
	(33.74)	(37.06)	(24.12)	(33.06)	(24.00)	(38.34)	(34.37)	(36.03)	(33.79)	(22.31)
GRGDP	0.05	0.05	0.05	0.05	0.04	0.05	0.05	0.05	0.06	0.06
	(5.51)	(5.48)	(3.60)	(5.61)	(3.58)	(5.88)	(5.46)	(5.49)	(5.74)	(4.45)
URBPOP	-0.04	-0.04	-0.05	-0.04	-0.05	-0.04	-0.04	-0.04	-0.03	-0.03
	(-3.44)	(-3.69)	(-4.28)	(-3.89)	(-4.28)	(-3.37)	(-3.50)	(-4.15)	(-3.13)	(-2.40)
DEFGDP	0.12	0.20	0.20	0.20	0.19	0.16	0.21	0.20	0.21	0.19
	(10.03)	(14.88)	(11.61)	(14.07)	(11.16)	(12.28)	(15.61)	(15.08)	(14.92)	(10.98)
DEFGDP1		-0.16	-0.15	-0.15	-0.14	-0.14	-0.16	-0.15	-0.15	-0.12
		(-12.06)	(-8.26)	(-10.83)	(-7.94)	(-11.44)	(-11.85)	(-11.51)	(-10.96)	(-6.67)
CGDBTGDP			0.00		0.00					-0.01
			(-1.82)		(-1.56)					(-3.09)
INTPAYGDP				-0.01	0.00					
				(-0.42)	(-0.08)					
GDFICAPGDP						-0.08				-0.10
						(-6.46)				(-6.08)
GDFICAPGDP1						0.08				0.08
						(5.91)				(4.45)
AIDGNP							0.06			0.08
							(4.89)			(4.29)
TRADEGDP								0.02		0.01
								(4.74)		(2.93)
FDIGDP									-0.01	
									(-0.69)	
Adj.R2	0.84	0.85	0.86	0.84	0.86	0.86	0.86	0.85	0.85	0.87
No.obs.	1700	1695	1022	1533	988	1524	1625	1651	1558	907
No.Cntrs	118	118	89	111	87	112	117	117	111	83
No.Yrs	28	28	28	28	28	28	28	28	28	28

Next we have added private investment spending as explanatory variable (Column (6) of Table 3). This variable has been constructed by substracting from the gross domestic fixed investment series the public capital spending series. Its contemporaneous coefficient is significantly negative, suggesting these two series behave as substitutes. Lagging private investment, however, reveals a significantly positive relationship.[12] Hence, public investment seems to follow private investment over time, whereas it crowds out private investment in any given year.

Foreign aid is added in Column (7) of Table 3. Additional foreign aid leads to larger spending of the government on capital. The same holds for the openness of a country (Column (8) of Table 3). Countries which see their shares of imports and exports increase spend more on public capital. Net foreign direct investment, however, does not help explaining public capital spending (Column (9) of Table 3).[13,14]

Column (10) of Table 3 includes all significant variables at once.[15] As follows, our basic conclusions do not change.[16]

4.3 Politico-institutional variables

We opt to use two different base models when checking the politico-institutional hypotheses: a parsimonious and comprehensive specification. Base model (1) includes only the lagged dependent variable, economic growth, urbanization and contemporaneous and lagged government deficits. Base model (2) also includes central government debt, contemporaneous and lagged private investment, foreign aid, and openness. Table 4 reports the results in case the parsimonious base model is used, whereas Table 5 shows the same regressions using the comprehensive base model.

We first check whether the ideology of the government plays a significant role in explaining public capital spending. Columns (1) and (2) of Tables 4 and 5 check the effect of the political 'colour'. Right-wing government—denoted by EXECR=1—are formed by parties that are defined as conservative, Christian democratic, liberal (European definition) or simply right-

[12] Removing contemporaneous or lagged private investment does not change this conclusion.

[13] We also experimented with gross foreign direct investment. The conclusion did not change.

[14] Lagging economic growth, urbanization level, foreign aid, openness, or foreign direct investment does not change any of the conclusions.

[15] Insignificant variables remain insignificant when included in this extended model.

[16] These conclusions are robust in case we restrict our attention to the largest balance sample possible (not shown).

Table 4: Politico-institutional variables using the parsimonious base model

Exp.var.	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
CAPGDP1	0.63	0.63	0.64	0.64	0.64	0.64	0.67	0.67	0.64
	(30.28)	(30.25)	(32.41)	(32.41)	(32.45)	(32.06)	(36.52)	(36.67)	(32.16)
GRGDP	0.06	0.06	0.05	0.05	0.05	0.05	0.05	0.05	0.05
	(5.81)	(5.81)	(5.70)	(5.70)	(5.69)	(5.67)	(5.50)	(5.50)	(5.64)
URBPOP	-0.05	-0.05	-0.05	-0.05	-0.05	-0.06	-0.04	-0.04	-0.06
	(-4.50)	(-4.60)	(-4.54)	(-4.52)	(-4.49)	(-4.76)	(-3.77)	(-3.72)	(-4.71)
DEFGDP	0.20	0.20	0.20	0.20	0.20	0.20	0.19	0.19	0.20
	(14.25)	(14.23)	(14.65)	(14.67)	(14.65)	(14.62)	(14.74)	(14.74)	(14.49)
DEFGDP1	-0.16	-0.16	-0.16	-0.16	-0.16	-0.17	-0.16	-0.16	-0.16
	(-11.15)	(-11.14)	(-11.81)	(-11.79)	(-11.82)	(-11.87)	(-12.02)	(-12.02)	(-11.79)
EXECL	0.26								
	(1.21)								
EXECR		0.05							
		(0.26)							
EXECNAT			0.27						
			(0.72)						
EXECREG				-0.49					
				(-0.76)					
EXELEC					-0.16				
					(-0.84)				
PRESIPCOH1						0.25			
						(1.38)			
PARLIPCOH0						-0.08			
						(-0.29)			
PARLIPCOH1						-0.24			
						(-0.52)			
PARLIPCOH2						-0.04			
						(-0.11)			
PARLIPCOH3						0.16			
						(0.38)			
CIVLIB							0.02		
							(0.42)		
POLRGHT								0.03	
								(0.51)	
STABNS2									-0.30
									(-1.66)
Adj.R2	0.86	0.86	0.87	0.87	0.87	0.87	0.85	0.85	0.87
No.obs.	1360	1360	1472	1472	1472	1471	1670	1670	1483
No.Cntrs	107	107	110	110	110	110	117	117	110
No.Yrs	23	23	23	23	23	23	27	27	23

wing. Left-wing governments—denoted by EXECL—are formed by parties that are defined as communist, socialist, social democratic, or simply left-wing. Columns (3) and (4) include dummies in case the party in power is listed as respectively nationalist (EXECNAT) or list rural issues as a key component of the party's platform (EXECREG).

Neither in the parsimonious base model nor in the comprehensive version the ideological variables are significant. Hence, we cannot find any evidence that government ideology seems to matter with respect to public capital spending.

To check for a political business cycle, we include a dummy capturing election years (EXELEC) (Column (5)). In contrast to Schuknecht (2000), who only looks at a group of 24 developing countries, no relationship is found.[17]

To capture possible effects of divided versus single-party governments, we use the Index of Political Cohesion (IPCOH) which is based on Roubini and Sachs (1989a, 1989b). This variable is defined in the following way:

For presidential systems:

- **0** same party in control of the executive and legislature (if multiple pro-presidential parties, they must together control the legislature)
- **1** different parties in control of the executive and legislature (if multiple pro-presidential parties, they must not control legislature)

For parliamentary systems:

- **0** one-party majority government
- **1** coalition government with two parties
- **2** coalition government with three or more parties
- **3** minority government

As pointed out by Edin and Ohlsson (1991) the construction of this political cohesion index places a very restrictive form on its effects. Why should public capital spending under a minority government be three times as low as under a two-party majority coalition or in case of a presidential system when different parties are in control of the executive and legislature? We have therefore constructed a dummy variable for each 'political class'.

[17] Lagged or future elections are also not significant (not shown).

Table 5: Politico-institutional variables using the comprehensive base model

Exp.var.	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
CAPGDP1	0.61	0.61	0.60	0.60	0.60	0.59	0.61	0.60	0.59
	(20.39)	(20.40)	(21.30)	(21.32)	(21.35)	(21.15)	(21.88)	(21.62)	(21.32)
GRGDP	0.04	0.04	0.05	0.05	0.05	0.05	0.06	0.06	0.05
	(3.63)	(3.60)	(4.08)	(4.08)	(4.08)	(4.08)	(4.44)	(4.43)	(4.10)
URBPOP	-0.05	-0.05	-0.05	-0.05	-0.05	-0.04	-0.04	-0.04	-0.05
	(-3.23)	(-3.35)	(-3.23)	(-3.22)	(-3.19)	(-2.52)	(-2.72)	(-2.72)	(-3.24)
DEFGDP	0.16	0.16	0.18	0.18	0.18	0.17	0.19	0.19	0.18
	(9.06)	(9.00)	(10.20)	(10.15)	(10.21)	(9.80)	(10.87)	(10.88)	(10.33)
DEFGDP1	-0.11	-0.11	-0.12	-0.12	-0.12	-0.12	-0.12	-0.12	-0.13
	(-6.40)	(-6.42)	(-7.07)	(-7.08)	(-7.08)	(-6.73)	(-6.54)	(-6.50)	(-7.15)
CGDBTGDP	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01
	(-2.75)	(-2.79)	(-3.35)	(-3.35)	(-3.38)	(-3.13)	(-3.19)	(-3.20)	(-3.35)
GDFICAPGDP	-0.09	-0.09	-0.11	-0.11	-0.11	-0.11	-0.10	-0.10	-0.11
	(-5.02)	(-5.07)	(-6.19)	(-6.20)	(-6.21)	(-6.32)	(-5.96)	(-5.99)	(-6.24)
GDFICAPGDP1	0.09	0.09	0.09	0.09	0.09	0.09	0.08	0.08	0.09
	(4.75)	(4.78)	(5.35)	(5.35)	(5.37)	(5.34)	(4.45)	(4.45)	(5.34)
AIDGNP	0.07	0.07	0.08	0.08	0.08	0.08	0.08	0.08	0.08
	(3.90)	(3.97)	(4.42)	(4.42)	(4.41)	(4.34)	(4.38)	(4.43)	(4.44)
TRADEGDP	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	(1.27)	(1.17)	(1.48)	(1.46)	(1.53)	(1.46)	(2.55)	(2.53)	(1.49)
EXECL	-0.01								
	(-0.03)								
EXECR		0.20							
		(0.93)							
EXECNAT			0.00						
			(-0.01)						
EXECREG				-0.04					
				(-0.07)					
EXELEC					-0.15				
					(-0.72)				
PRESIPCOH1						-0.61			
						(-2.62)			
PARLIPCOH0						0.27			
						(0.83)			
PARLIPCOH1						-0.21			
						(-0.47)			
PARLIPCOH2						0.07			
						(0.16)			
PARLIPCOH3						0.25			
						(0.60)			
CIVLIB							(-0.09)		
							(-1.23)		
POLRGHT								(-0.09)	
								(-1.45)	
STABNS2									-0.13
									(-0.67)
Adj.R2	0.88	0.88	0.89	0.89	0.89	0.89	0.87	0.87	0.89
No.obs.	741	741	803	803	803	803	898	898	806
No.Cntrs	74	74	77	77	77	77	83	83	78
No.Yrs	23	23	23	23	23	23	27	27	23

A presidential system in which the same party is in control of the legislature and the executive is chosen to be the bench mark. Hence, all political cohesion dummies should be interpreted relative to this. If we concentrate on the comprehensive model, presidential systems in which different parties have control of the legislature and the executive (PRESIPCOH1) appear to significantly spend less on public capital. This is in line with the hypothesis of Roubini and Sachs (1989b). However, this result is not robust as focusing on the parsimonious model shows us. For parliamentary systems we do not find any evidence in favor of the hypothesis. The four dummy variable (PARLIPCOH0, PARLIPCOH1, PARLIPCOH2, PARLIPCOH3) are not significantly different from each other.

We use Gastil's ranking of countries with respect to their democratic character. The survey's regular publication by Freedom House provides useful and consistent time series. Gastil has created two measures of liberty: political liberty (POLRGHT) and civil liberty (CIVLIB). Both are ranked from 1 (the highest degree of liberty) to 7 (the lowest). The political rights rankings are based on the degree to which individuals in a state have control over those who govern. The civil rights rankings purport to measure the rights of the individual (e.g. independence of the judiciary, freedom of the press, freedom of assembly and demonstration, freedom of political organisation, free trade unions, free religious institutions). The measures are available from 1973 onwards.

We do not have a measure of economic freedom on a yearly basis. The most commonly used yardstick is constructed by Gwartney et al. (1996) and published on a five-year interval. De Haan and Sturm (2001) show that the level of democracy and economic freedom is highly correlated. Hence, we presume that Gastil's measures for democracy also proxy for economic freedom.

Columns (7) and (8) of Tables 4 and 4 show that neither CIVLIB nor POLRGHT is significant. In Table 5 both variables do not even have the expected positive sign.[18]

The variable STABNS2 counts the percent of veto players who drop from the government in any given year. Veto players are defined as follows: for presidential systems, the veto players are the president, the largest government party, and the largest party in the Senate; for parliamentary systems, veto players are defined as the Prime Minister and the biggest three coalition members.[19] Using the parsimoneous base model, the coefficient of

[18]We do not find any significant relationship either when using five-year averages and the economic freedom indicator of Gwartney et al. (1996).

[19]If the is no legislatuture, an unelected legislature, an elected legislature with only 1

this variable is significantly different from zero at a 10 per cent significance level. This result is, however, not robust, as the comprehensive model shows us.[20,21]

5 Concluding remarks

In this paper, a model is estimated to examine whether various hypotheses put forward to explain the downward trends in public capital spending are supported by the data. Using panel data for up to 123 less-developed countries for the period 1970–1998, the following hypotheses are tested:

(1) Capital spending is increased during periods of increased economic growth. Apparantly governments in developing countries do not use capital spending as a tool for counter-cyclical policy. The positive relationship can be interpreted as evidence in favour of Wagner's law, i.e. infrastructure has a high income elasticity of demand.

(2) Increased urbanization lead to less demand for public capital spending. Rural areas need relatively more spending on infrastructure as compared to urbanized areas.

(3) Public capital spending appear to be largely financed by increasing deficits. However, high deficits in the past decrease public capital spending in the present.

(4) Related to the previous point, highly indebted governments spend less on public capital. Apparently in case of fiscal stringency, government capital spending is an easy target for cuts.

(5) Contemporaneous private investment and public capital spending behave as substitutes. Lagged private investment, however, has a stimulating effect on public capital spending.

candidate or 1 party in year t-1, then STABNS2 in year t is based only on changes in the chief executive.

[20] One may express some doubt whether our variable STABNS2 is a good proxy for the political stability and therefore the time horizon of policymakers if measured on an annual basis. Therefore, we have also estimated the model using five-year averages instead of annual observations. We find no significant effect.

[21] We also experimented with other measures for political instability. These are the number of assassinations, strikes, guerilla problems, government crises, purge, riots, revolutions, and anti-government demonstrations. The source is Sierman (1998) and the data cover the period up to 1994. None of these variables is significant in any of the regressions.

(6) Foreign aid positively affect government spending on public capital.

(7) Increased openness of an economy leads to increased investment in public capital.

(8) Politico-institutional variables, like ideology, political cohesion, political stability and political business cycles do not seem to be important when explaining government capital spending in less-developed economies.

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